ANNUAL WATER MANAGEMENT PLAN 1993-1994

Arapaho National Wildlife Refuge
Walden, CO

I. General

Four main sources of water are used at Arapaho National Wildlife Refuge to provide irrigation, maintain pond levels and sustain riparian vegetation for wildlife. These four sources include the Illinois River, Spring Creek, Antelope Creek, and Potter Creek. Eighteen different structures divert water out of the Illinois River into more than 70 miles of primary delivery ditches. This water supplies nearly 70 ponds with over 700 surface acres of water during a normal year. It is also used to flood irrigate 8,000 acres of meadow to maintain and perpetuate quality waterfowl breeding, nesting and brood rearing habitat.

The Illinois River opened up in late March running approximately 300 cfs, this dropped to 80 cfs in April. Spring run-off started in mid April with 160 cfs climbing to 216 cfs in late April where it stayed until mid June. The river flow began dropping throughout July and August from 90 cfs down to 25 cfs, September flows averaged 30 cfs and remained constant until the river iced over.

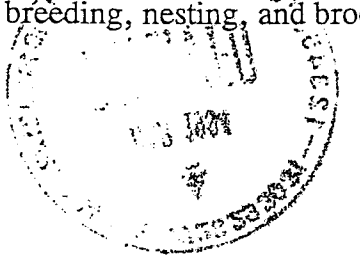
We began diverting water in March as ditches and headgates became ice-free, to fill refuge ponds before low water would require irrigation shut downs. All ponds were filled this year and remained in good shape throughout the summer. By early August most ditches were dry or closed. Refuge ponds maintained their water late into the fall and were in better condition than the previous four years.

Precipitation in 1993 was 11.82 inches, 2.27 inches above the normal with snowfall measuring 55.6 inches in Walden. This combination produced a good spring runoff, resulting in excellent spring, summer and fall habitat conditions.

The outlook for 1994 is good with precipitation levels near normal and water table levels up. Snow pack levels are approximately 90 percent of normal this year. If the area receives normal precipitation through the months of March and April the outlook for water should be good.

II. Purpose and Methods

Spring run-off is diverted from natural water courses into delivery ditches to provide ponds and irrigation systems with water. Approximately 8,000 acres of meadows are irrigated during an average water year to provide quality breeding, nesting, and brooding



habitat. Numerous small ponds and impoundments are also managed via diverted water each year. Fox pond and 404 pond were constructed on the refuge in 1992 by private contract, and were filled this year enhancing the existing wetlands on the refuge.

Current water management practices greatly depend on winter snow packs, spring moisture and downstream water demands. However, during normal water years, the following schedule is used to provide general guidance:

April - (spring breakup) Drain upstream storage reservoirs (Case #1, #2, #3) on to lower units to initiate open water to attract and hold waterfowl. These reservoirs are then refilled with spring run-off water and held at optimum levels. (Because of recent dam inspections, Case reservoir #1 will remain below operating levels until rehab work can be accomplished.)

May - Initiate meadow irrigation as soon as ditches are ice-free and operable. Perform ditch maintenance as able and needed. Record water flow measurements.

June - Maintain reservoir levels and continue irrigation and maintenance. Record water flow measurements.

July - Consolidate water as necessary to provide brood habitat. Begin repairs on dikes and control structures and any new construction projects. Record water flow measurements.

August - Continue repair/construction work. Record water flow measurements. Adjust water to minimize avian botulism outbreaks.

September - Prepare for scheduled winter fill of storage reservoirs as able. Manage water levels to minimize avian botulism outbreaks. Continue work on construction and repair projects.

October - Winterize water system, drain irrigation ditches, "set" water system in preparation for spring run-off. Continue construction/repair work as able.

November - Normal freeze-up period. Pre-snowfall dirt work still possible.

December - March - Normally cold, frozen conditions prevent water management. Nesting structures can be repaired/maintained and other minor work can be accomplished.

I. 1993 Water Usage

Water usage is determined primarily by weekly reading and recording water flows through Parshall flumes located just downstream from the various diversion structures of each irrigation ditch system. In instances where measuring devices have not been installed or where regular monitoring is not possible, estimates are made relative to the known water use in other irrigation ditch systems.

Table I, reflects the amount of water diverted into the various irrigation systems serving Arapaho National Wildlife Refuge in 1993. Some individual diversions are only estimates resulting from the lack of a measuring device or due to flooding where waters overflowed ditch banks.

The total of 38,752 acre feet of water diverted represents approximately 56% more water then in 1992. Good spring runoff and summer rains accounted for this increase in water and resulted in favorable wetland conditions. Water was diverted in the fall, supplementing some ponds and filling several ponds that had been drawndown for dike work or regeneration.

IV. Proposed 1994 Water Use

Water use in 1994 will not be substantially different from that planned for previous years. All ponds will be filled as early as possible in the spring to maximize spring run-off use. Optimum water levels will be maintained for as long as possible to encourage waterfowl mating, nesting, and brood rearing.

One of the following general plans will be implemented dependent upon the availability of water in 1994:

Plan A - Average Water Year

1. Refuge ponds will be filled as early as possible to encourage spring migrants to mate and nest on the refuge.

2. Meadow areas will be irrigated by take-outs in the diversion ditches or sub-irrigated by seepage from the ditches.

3. As many ponds as possible will be maintained at optimum levels for as long as possible. If necessary some ponds may be sacrificed for more important brood ponds later in the summer.

4. Following the upstream irrigation season of hay meadows, increased flow in the Illinois River may be used to refill refuge ponds (where necessary) in order to provide fall migrational habitat and reserve water for the following year.

Plan B - Extremely Wet Water Year

1. Marginal meadow areas not normally irrigated will be irrigated to provide additional improved wildlife habitat.

2. Additional water will be circulated through impoundments keeping them fresh, which will aid in the production of emergent and submergent vegetation and encourage invertebrates as sources of food and cover for wildlife.

3. Water will run longer in the season keeping impoundments relatively full at freeze-up. This will help ensure that at least some water will be available the following spring even in the event of a dry year.

4. By running the water longer, many small wetland depressions in the meadows can be maintained as brood-rearing habitat, thus preventing concentrations of broods on a few ponds where they are more susceptible to predation and disease outbreaks such as avian botulism.

Plan C - Extremely Dry Water Year

1. Fill as many ponds as possible to capacity and maintain to provide territorial water for breeding and nesting pairs and cover for broods and molters.

2. Irrigate refuge meadows adjacent to permanent bodies of water.

3. Irrigate refuge meadows further removed from permanent ponds as available water permits.

4. Suspend implementation of drawdowns to conserve as much water for as long as possible.

V. 1993-1997 Planned Drawdown

A new five-year drawdown plan was initiated last year for several of the ponds on the refuge. This plan was updated by reviewing past years, drawdowns, vegetation growth, invertebrate populations, and dike repair needs. Scheduled drawdowns may be canceled or postponed if the prevailing water condition so dictates. Lack of water can effectively result in an unscheduled drawdown for certain ponds and may be used as such even if it does not coincide with the existing plan.

As we continue to monitor vegetation growth and invertebrate populations within our ponds we will update our drawdown program as necessary. Occasionally water management is dictated by priorities set for rehabilitation of dikes and control structures. As more rehabilitation is accomplished many of the ponds will take their turn in

drawdown status, at least for a short time. Also, drawdowns are coordinated with the refuge's grazing program so cattle are not deprived of water when in a particular area.

Pond	Date	Prescription	Status
South McCammon Pond	April 1993	Release water to North McCammon Pond. Keep pond dry through summer refill fall of 1993.	Drawdown was implemented in spring, pond was tilled in fall. Pond will remain dry until fall 1994 to promote veg. growth.
Rizor Pond	April 1993	Release water to Follett pond. Keep pond dry spring, summer and fall. Fill spring of 1994.	Drawdown was completed, will fill pond in spring of 1994.
Patten Pond	April 1993	Release water to Eisemann pond. Keep pond dry, filling it the spring of 1994.	Drawdown was completed, filling started in fall of 1993, will be completed spring 1994.
Reservoir #2 Annex Pond	October 1993	Release water to Greasewood pond. Keep pond dry, filling it the spring of 1995.	Drawdown could not be completed as there is no water control structure.
Buddys Pond	October 1993	Release water to Living Room pond. Keep pond dry, filling it the spring of 1995.	On schedule.
Varney Pond	October 1993	Release water to Eisemann pond. Keep pond dry through summer of 1994 and fill the fall of 1994.	On schedule.
Abraham Pond	October 1994	Release water to Follett pond. Keep pond dry, filling it the spring of 1996.	On schedule.
Hampton #2 Pond	October 1994	Release water to Potter Creek. Keep pond dry, filling it the spring of 1996.	On schedule.
Prairie Dog Pond	October 1995	Release water to Antelope pond. Keep pond dry, filling it the spring of 1997.	On schedule.
Wilson Pond	October 1995	Release water to Avocet pond. Keep pond dry, filling it the spring of 1997.	On schedule.
125 Pond	October 1996	Release water to Varney pond. Keep pond dry, filling it the spring of 1998.	On schedule.
Follett Pond	October 1996	Release water to Old Road pond. Keep pond dry, filling it the spring of 1998.	Drawdown initiated in fall of 1993 to replace Res. #2 Annex.

VI. Comments and Problems

The following water management related projects were accomplished in 1993 at Arapaho NWR.

1. Rehabilitation of Eisemann and Old Road pond dikes, water control structures were reset using bentonite in hopes of eliminating recurring problems with these leaking structures.

2. Washouts on Anderson drain dike were temporarily rehabilitated until major repairs can be accomplished.

3. A large washout in the Caudle ditch along with several small washouts in the Riddle ditch were repaired.

4. Numerous ditches on the Allard, Hackley and Case were cleaned.

5. Four new ponds were constructed by a private contractor, the dikes were completed in late fall with construction being halted until spring, when the water control structures will be installed.

The following work, not in priority order, is needed and will be accomplished as manpower and working conditions permit:

1. Construction of new ponds as priorities and working conditions permit.

2. Replace six deteriorating or missing river headgates on the Home, Hill & Crouter, Dryer, Ward #2, Everhard & Baldwin and Ish & Baldwin ditches.

3 Install Parshall flumes in the Ish & Baldwin, Midland (Ross), Antelope, Potter #2, Hubbard #4, and Ward #2 ditches. Also in the Case Reservoirs #1,2,3, State Walden Pipeline, State Walden Reservoirs.

4. Placement of rip-rap on several dikes.

5. Reset Parshall flumes in Home, Oklahoma #1, Midland, Hubbard #1, Riddle and Dryer ditches.

6. Repair take-outs in Dryer Ditch.

7. Determine surface acreage and storage capacity for eleven existing ponds and all new ponds.

8. Surveys of impoundment outlets and installation of water level gauges (as directed in Dam Safety Inspections).

9. Rehabilitate dikes and control structures as directed by Dam Safety Inspections (as able with existing funds).

10. Continue ditch clean-outs as necessary (by contract if possible).

11. Measure capacity of Fish Hatchery spring (Potter Creek) to determine amount of water flowing into Potter #2 ditch.

POND NAME	POINT OF DIVERSION QUARTER(S)	SEC.	TWN.	RANGE	SURFACE ACRES	AF CAP.	YEAR CONST.	SOURCE	REMARKS
DITCH: ANTELOPE DITCH -- AF AMT DIVERTED 1993: 200 -- MEASUREMENT FLUME: N									
					0.00	0			
BY DITCH - POND SUBTOTALS:					0.00	0			
DITCH: BOYCE BROTHERS DITCH -- AF AMT DIVERTED 1993: 1,974 -- MEASUREMENT FLUME: Y									
BROCKER POND, NORTH	NW	3	8N	79W	14.95	15	1980	ILLINOIS RIVER	
BY DITCH - POND SUBTOTALS:					14.95	15			
DITCH: DRYER DITCH -- AF AMT DIVERTED 1993: 1,263 -- MEASUREMENT FLUME: Y									
					0.00	0			
BY DITCH - POND SUBTOTALS:					0.00	0			
DITCH: EVERHARD & BALDWIN -- AF AMT DIVERTED 1993: 2,791 -- MEASUREMENT FLUME: Y									
					0.00	0			
BY DITCH - POND SUBTOTALS:					0.00	0			
DITCH: HILL & CROUTER DITCH -- AF AMT DIVERTED 1993: 911 -- MEASUREMENT FLUME: Y									
					0.00	0			
BY DITCH - POND SUBTOTALS:					0.00	0			
DITCH: HOME DITCH #1 -- AF AMT DIVERTED 1993: 1,987 -- MEASUREMENT FLUME: Y									
HOME POND	NW SW NE	33	9N	79W	27.05	52	1978	ILLINOIS RIVER	
BY DITCH - POND SUBTOTALS:					27.05	52			

POND NAME	POINT OF DIVERSION QUARTER(S) -SEC.-TWN.-RANGE				SURFACE ACRES	AF CAP.	YEAR CONST.	SOURCE	REMARKS
DITCH: HUBBARD DITCH #1 -- AF AMT DIVERTED 1993: 1,093 -- MEASUREMENT FLUME: Y									
					0.00	0			
BY DITCH - POND SUBTOTALS:					0.00	0			
DITCH: HUBBARD DITCH #2 -- AF AMT DIVERTED 1993: 0 -- MEASUREMENT FLUME: Y									
BIRDIE POND	SW	20	8N	80W	3.44	9	1976	ILLINOIS RIVER	to #3, #4 & Hub. Caudle
EAGLE POND	NW NW SW	20	8N	80W	7.74	22	1976	ILLINOIS RIVER	to #3, #4 & Hub. Caudle
SOLBERG POND	S1/2 SW	20	8N	79W	8.60	11	1985	ILLINOIS RIVER	to #3, #4 & Hub. Caudle
BY DITCH - POND SUBTOTALS:					19.78	42			
DITCH: HUBBARD DITCH #3 -- AF AMT DIVERTED 1993: 36 -- MEASUREMENT FLUME: Y									
ANTELOPE POND	N1/2 SW	7	8N	80W	22.42	77	1974	ILLINOIS RIVER	* AND HUBBARD #4 thru #2
BUDDIES POND	SE	13	8N	80W	6.93	15	1972	ILLINOIS RIVER	through Hubbard #2
EISEMANN POND	NW SE	18	8N	80W	5.29	15	1986	ILLINOIS RIVER	through Hubbard #2
GOOSE POND	SE	13	8N	80W	15.52	49	NATL	ILLINOIS RIVER	* AND HUBBARD #4/thru #2
LIVING ROOM POND	SE NE SW	13	8N	80W	2.41	6	1972	ILLINOIS RIVER	* AND HUBBARD #4/thru #2
MARSH POND	SE	13	8N	80W	12.58	15	NATL	ILLINOIS RIVER	* AND HUBBARD #4/ thru #2
MUSKRAT POND	NW	7	7N	80W	99.00	390	1985	ILLINOIS RIVER	* AND HUBBARD #4/thru #2
PATTEN POND	SW SE	18	8N	79W	3.30	10	1986	ILLINOIS RIVER	through Hubbard #2
PRAIRIE DOG POND	SW NE SW	18	8N	79W	4.95	18	1986	ILLINOIS RIVER	through Hubbard #2
RAT DITCH POND	NW	20	8N	79W	2.82	0	1987	ILLINOIS RIVER	CAP NOT DET / thru #2
ROADSIDE POND, NORTH	SE SE SE	12	8N	80W	0.00	4	1972	ILLINOIS RIVER	* AND HUBBARD #4/thru #2
ROADSIDE POND, SOUTH	SE NW NE	13	8N	80W	2.42	6	1972	ILLINOIS RIVER	* AND HUBBARD #4/thru #2
BY DITCH - POND SUBTOTALS:					177.64	605			
DITCH: HUBBARD DITCH #4 -- AF AMT DIVERTED 1993: 2,613 -- MEASUREMENT FLUME: N									
#125 POND	NE SE	19	8N	79W	6.62	17	1986	ILLINOIS RIVER	through Hubbard #2
#76 POND	NE NW	13	8N	80W	25.06	61	1976	ILLINOIS RIVER	through Hubbard #2
ALKALI POND	NE	11	8N	80W	12.79	22	NATL	ILLINOIS RIVER	through Hubbard #2

POND NAME	POINT OF DIVERSION QUARTER(S)	-SEC.	-TWN.	-RANGE	SURFACE ACRES	AF CAP.	YEAR CONST.	SOURCE	REMARKS
AVOCET POND	SE	11	8N	80W	8.52	12	NATL	ILLINOIS RIVER	through Hubbard #2
BLUEBILL POND	SE	14	8N	80W	6.22	19	NATL	ILLINOIS RIVER	through Hubbard #2
BREWERS POND	SW NW	14	8N	80W	23.37	60	1978	ILLINOIS RIVER	through Hubbard #2
BULRUSH POND	NW NW	12	8N	80W	9.74	16	1981	ILLINOIS RIVER	through Hubbard #2
CASE CONTOUR, MIDDLE	NW NW	13	8N	80W	1.06	0	1977	ILLINOIS RIVER	CAP NOT DET / thru #2
CASE CONTOUR, NORTH	NW	13	8N	80W	1.35	0	1977	ILLINOIS RIVER	CAP NOT DET / thru #2
CASE CONTOUR, SOUTH	SW NW	13	8N	80W	1.08	0	1977	ILLINOIS RIVER	CAP NOT DET / thru #2
CASE RES. #2 ANNEX POND	NW	13	8N	80W	5.69	13	NATL	ILLINOIS RIVER	through Hubbard #2
CASE RESERVOIR #1	SE SW SE	13	8N	80W	26.40	124	1970	ILLINOIS RIVER	through Hubbard #2
CASE RESERVOIR #2	SW NW	13	8N	80W	28.30	106	1952	ILLINOIS RIVER	through Hubbard #2
CASE RESERVOIR #3	SW NW NW	14	8N	80W	15.13	67	1952	ILLINOIS RIVER	through Hubbard #2
CATTAIL POND	SW SE	12	8N	80W	4.06	9	1980	ILLINOIS RIVER	through Hubbard #2
ELK POND	NW SW	13	8N	80W	34.88	90	1976	ILLINOIS RIVER	through Hubbard #2
GREASEWOOD POND	SW SW	12	8N	80W	4.41	10	1980	ILLINOIS RIVER	through Hubbard #2
HEADWATERS POND	NE SW	24	8N	80W	11.90	0		ILLINOIS RIVER	CAP NOT DETERMINED
HORSESHOE POND	SE NE	15	8N	80W	0.92	2	1975	ILLINOIS RIVER	through Hubbard #2
KITCHEN POND	SW	13	8N	80W	4.07	9	NATL	ILLINOIS RIVER	through Hubbard #2
N. TOUR ROUTE POND	SE	14	8N	80W	0.00	0	1979	ILLINOIS RIVER	CAP NOT DET / thru #2
POTTER CREEK POND	NE SE	12	8N	80W	35.98	111	1974	ILLINOIS RIVER	through Hubbard #2
S. TOUR ROUTE POND	SE	14	8N	80W	0.00	0	1979	ILLINOIS RIVER	CAP NOT DET / thru #2
VARNEY POND	N1/2 SW	19	8N	79W	9.71	21	1986	ILLINOIS RIVER	through Hubbard #2
WILSONS POND	SW SW SW	11	8N	80W	6.75	14	1978	ILLINOIS RIVER	through Hubbard #2
BY DITCH - POND SUBTOTALS:					284.01	783			

DITCH: HUBBARD/CAUDLE EXT. -- AF AMT DIVERTED 1993: 2,363 -- MEASUREMENT FLUME: Y

404 POND	NW NE	18	8N	79W	0.00	0	1992	ILLINOIS RIVER	CAP NOT DETERMINED
ABRAHAM POND	NE	20	8N	79W	6.25	20	1987	ILLINOIS RIVER	through Hubbard #2
DIVERSION POND	SE	20	8N	79W	3.93	0	1987	ILLINOIS RIVER	CAP NOT DET / thru #2
FOLLETT POND	NW	20	8N	79W	2.99	10	1987	ILLINOIS RIVER	through Hubbard #2
HAMPTON #1 POND	SE	5	8N	79W	0.00	0	1990	ILLINOIS RIVER	CAP NOT DET / thru #2
HAMPTON #2 POND	NE SE	5	8N	79W	6.67	22	1977	ILLINOIS RIVER	through Hubbard #2
HAMPTON #3 POND	NW SE	5	8N	79W	7.46	25	1978	ILLINOIS RIVER	through Hubbard #2
OLD ROAD POND	NW	20	8N	79W	0.00	0	1987	ILLINOIS RIVER	CAP NOT DET / thru #2
RIZOR POND	NE	20	8N	79W	3.51	11	1987	ILLINOIS RIVER	through Hubbard #2
SMITH POND	SW SE NE	20	8N	79W	8.03	12	1981	ILLINOIS RIVER	through Hubbard #2

POND NAME	POINT OF DIVERSION QUARTER(S) -SEC.-TWN.-RANGE				SURFACE ACRES	AF CAP.	YEAR CONST.	SOURCE	REMARKS
					BY DITCH - POND SUBTOTALS: 38.84	100			
DITCH: ISH & BALDWIN DITCH -- AF AMT DIVERTED 1993: 0 -- MEASUREMENT FLUME: N									
					0.00	0			
					BY DITCH - POND SUBTOTALS: 0.00	0			
DITCH: MIDLAND-HACKLEY DTCH -- AF AMT DIVERTED 1993: 883 -- MEASUREMENT FLUME: Y									
GERM POND	SW NE	12	7N	80W	7.54	28	1974	ILLINOIS RIVER	
					BY DITCH - POND SUBTOTALS: 7.54	28			
DITCH: MIDLAND-ROSS DITCH -- AF AMT DIVERTED 1993: 950 -- MEASUREMENT FLUME: N									
HACKLEY POND NORTH	SW SW	12	7N	80W	4.30	0		ILLINOIS RIVER	CAP NOT DETERMINED
HACKLEY POND SOUTH	SW SW	12	7N	80W	3.60	0		ILLINOIS RIVER	CAP NOT DETERMINED
RODRIQUEZ POND	NW NE	12	7N	80W	11.07	0		ILLINOIS RIVER	CAP NOT DETERMINED
ROSS POND	SE NE	1	8N	80W	4.37	5	1982	ILLINOIS RIVER	
					BY DITCH - POND SUBTOTALS: 23.34	5			
DITCH: NATL RUNOFF-NO DITCH -- AF AMT DIVERTED 1993: 0 -- MEASUREMENT FLUME: N									
BROCKER POND, SOUTH	NE NW SW	3	8N	79W	0.00	15			Not Yet Constructed
FOX POND	SE NW NE	10	8N	79W	48.00	108	1992	SPRING CREEK	
SPRING CREEK POND	S1/2 NE NE	15	8N	79W	26.15	63	1980	SPRING CREEK	
					BY DITCH - POND SUBTOTALS: 74.15	186			
DITCH: NORTH PARK DITCH #6 -- AF AMT DIVERTED 1993: 4,192 -- MEASUREMENT FLUME: Y									
					0.00	0			
					BY DITCH - POND SUBTOTALS: 0.00	0			

POND NAME	POINT OF DIVERSION QUARTER(S)	-SEC.-	-TWN.-	-RANGE	SURFACE ACRES	AF CAP.	YEAR CONST.	SOURCE	REMARKS
DITCH: OKLAHOMA DITCH #1 -- AF AMT DIVERTED 1993: 3,283 -- MEASUREMENT FLUME: Y									
ALLARD CONTOUR, MIDDLE	S1/2 NW	29	8N	79W	4.03	0	1981	ILLINOIS RIVER	CAPACITY NOT DETERMINED
ALLARD CONTOUR, NORTH	S 1/2	20	8N	79W	2.85	0	1981	ILLINOIS RIVER	CAPACITY NOT DETERMINED
ALLARD CONTOUR, SOUTH	NW	29	8N	79W	4.43	0	1981	ILLINOIS RIVER	CAPACITY NOT DETERMINED
ANDERSON CONTOUR	S1/2	5	7N	79W	9.06	0	NATL	ILLINOIS RIVER	CAPACITY NOT DETERMINED
ANDERSON DRAIN	S1/2	5	7N	79W	14.01	20	NATL	ILLINOIS RIVER	
COYOTE POND	SW	20	8N	80W	1.52	3	1979	ILLINOIS RIVER	
FISHERMAN'S PARKING POND	NE	5	7N	79W	0.00	0	NATL	ILLINOIS RIVER	CAPACITY NOT DETERMINED
POTHOLE POND	NW	5	8N	79W	3.40	7	1970	ILLINOIS RIVER	
BY DITCH - POND SUBTOTALS:					39.30	30			
DITCH: OKLAHOMA DITCH #2 -- AF AMT DIVERTED 1993: 997 -- MEASUREMENT FLUME: Y									
ALLARD POND, NORTH	NW SW NE	5	8N	79W	13.98	38	1978	ILLINOIS RIVER	
ALLARD POND, SOUTH	SW NE SE	5	8N	79W	15.16	48	1978	ILLINOIS RIVER	
BY DITCH - POND SUBTOTALS:					29.14	86			
DITCH: POTTER DITCH #2 -- AF AMT DIVERTED 1993: 150 -- MEASUREMENT FLUME: N									
FISH HATCHERY POND, EAST	NW SE	15	8N	80W	2.19	8	1950	FISH HATCHERY SPRING	
FISH HATCHERY POND, WEST	N1/2 S1/2	15	8N	80W	0.93	2	1950	FISH HATCHERY SPRING	
BY DITCH - POND SUBTOTALS:					3.12	10			
DITCH: RIDDLE DITCH -- AF AMT DIVERTED 1993: 1,581 -- MEASUREMENT FLUME: Y									
					0.00	0			
BY DITCH - POND SUBTOTALS:					0.00	0			
DITCH: STATE WALDEN PIPELNE -- AF AMT DIVERTED 1993: 500 -- MEASUREMENT FLUME: N									
					0.00	0			

POND NAME	POINT OF DIVERSION QUARTER(S) -SEC.-TWN.-RANGE			SURFACE ACRES	AF CAP.	YEAR CONST.	SOURCE	REMARKS
	BY DITCH - POND SUBTOTALS:			0.00	0			
DITCH: STATE WALDEN RES. -- AF AMT DIVERTED 1993: 35 -- MEASUREMENT FLUME: N								
				0.00	0			
	BY DITCH - POND SUBTOTALS:			0.00	0			
DITCH: WARD DITCH #1 -- AF AMT DIVERTED 1993: 5,805 -- MEASUREMENT FLUME: Y								
MCCAMMON POND, NORTH	NW NE NE	21	8N 79W	3.52	8	1972	ILLINOIS RIVER	
MCCAMMON POND, SOUTH	SE NW NE	21	8N 79W	13.68	41	1978	ILLINOIS RIVER	
WILLFORD POND	NW NE NW	15	8N 79W	15.55	62	1980	ILLINOIS RIVER	
	BY DITCH - POND SUBTOTALS:			32.75	111			
DITCH: WARD DITCH #2 -- AF AMT DIVERTED 1993: 3,053 -- MEASUREMENT FLUME: N								
				0.00	0			
	BY DITCH - POND SUBTOTALS:			0.00	0			
DITCH: WARD DITCH #3 -- AF AMT DIVERTED 1993: 2,092 -- MEASUREMENT FLUME: Y								
SCHOOL POND, NORTH	S1/2 NW SE	16	8N 79W	11.13	30	1978	ILLINOIS RIVER	* AND HUBBARD DITCH #1
SCHOOL POND, SOUTH	SW SW SE	16	8N 79W	10.65	27	1978	ILLINOIS RIVER	* AND HUBBARD DITCH #1
	BY DITCH - POND SUBTOTALS:			21.78	57			

POND NAME	POINT OF DIVERSION QUARTER(S) -SEC.-TWN.-RANGE	SURFACE ACRES	AF CAP.	YEAR CONST.	SOURCE	REMARKS

G R A N D T O T A L S -

POND DIVERSIONS: 793.39 Surface Acres 2,110 AF Capacity

DITCH DIVERSIONS: 38,752 AF

MEADOW IRRIGATION: 36,642 AF

1994
WATER MANAGEMENT PLAN/
1993 USE REPORT
SHORT FORM

Station Name
Bamforth NWR, WY

Date of Inspection
June 21, 1989

Water Right No.
1887-Territorial

Source(s)
Little Laramie River

Water Diverted: Yes X No

Means of Diversion
Rate

*Impoundment(s): Yes X No

Water Level 2 acre feet Approx.
(Elevation or Est. Storage Amount)

*Well(s)
Free Flowing N/A gpm
Pumped N/A gpm

Type of Use:
Surface Irrigation X
(Crop)
Fish & Wildlife X
Stock X
Domestic
Other

Overall Climatic Conditions:
Water conditions in 1993 were marginal, irrigation from the Park Ditch was limited to fourteen days at approximately .85 cfs flow.

Conditions of Facilities:
The Park Ditch is in fair to poor condition and in need of some rehabilitation. The cost/benefit ratio of such rehab is questionable.

Proposed Water Program:
1994 - Continue to irrigate meadows when adequate water is available in the Park Ditch. Mr. Leonard Johnson, refuge neighbor and grazing permittee on the refuge, conducts all irrigation activities on the refuge as a condition of his permit.

Comments:
The Park Ditch contains 18.42 cfs of high water right that is not honored except in excellent run-off years because of the large amount of water appropriations senior to its 1887 and 1900 applications. The principal Little Laramie River water user is the Wheatland Irrigation District. The Park Ditch receives water only before the District "calls" for its water and only in proper adjudicated order. The Park Ditch headgate is the first one to be closed by the Water Commissioner when the Wheatland Irrigation District calls for water. Our water right for 1.71 cfs in the Park Ditch is therefore not a good water right.

1993 WATER USE REPORT - 1994 WATER MANAGEMENT PLAN

Hutton Lake National Wildlife Refuge, Laramie, WY
Administered by
Arapaho National Wildlife Refuge, Walden, CO

I. Water Rights

Hutton Lake NWR Water Rights

Priority	Ditch	Priority Date Use	Refuge CFS	Acres	Source
1	Red	1871 Irrigation	.15	10	Sand Creek
9	Richards	1888 Irrigation	.60	42	Sand Creek
12 1/2	Hutton Lake Reservoir	1892 Irrigation	2,500AF	--	Sand Creek
Permit #5212-E	1st Enlarge-ment Hutton Lake Ditch	1939 Irrigation Bird Refuge	1.6	112	Sand Creek
Permit #2304-E	Enlargement Kings Ditch	1909 Irrigation	Portion of 8.27	Portion of 579	Laramie River

II. 1993 Water Usage

The Sand Creek headgate was opened in January and remained open throughout most of the year. Approximately 1,963 acre feet was diverted, resulting in the largest influx of water in many years. Water flowing into Rush Lake was diverted to Lake George, in order to maintain Wyoming toad habitat, then on to Creighton Lake to enhanced this drying wetland. Excess water from Rush Lake was diverted to Hoge Lake in an effort to refill this wetland. In late December, Hoge Lake was full with water flowing into Hutton Lake. Overall it was an excellent water year for the refuge, the first in many years.

Several water management facilities were rehabilitated this year, including a new parshall flume and headgate gates, replacing the old existing structures. A new water control structure was installed between Rush Lake and Lake George. A culvert was installed in a gully near Rush Lake, making the south entrance to Sand Creek's headgate accessible. Rip-rap was placed along all disturbed areas to limit erosion.

III. Capacity of Refuge Lakes

Lakes	Maximum Surface Acres	Maximum Acre Feet	Actual Surface Acres (Est.) 4/93	12/93
Hutton	221 (variable)	1,135	80	40
Hoge	75	200	20	75
Rush	95	250	95	85
George	16	62	16	15
Creighton	210	2,525	40	110
TOTALS	617	4,172	251	325

IV. 1994 Proposed Water Use

Divert water during the winter months until early spring, from .5 cfs up as high as possible. Filling Rush Lake to near capacity, then diverting water out of Rush to Lake George first and then the other ponds if there is enough water.

If time and funds permit work will be done to rehabilitate Sand Creek headgate, building up the ditch around the area. All disturbed areas, from last years work, will be harrowed and seeded.

1993 WATER USE REPORT - 1994 WATER MANAGEMENT PLAN

Mortenson Lake National Wildlife Refuge, Laramie, WY
Administered by
Arapaho National Wildlife Refuge, Walden, CO

I. Water Rights

Mortenson Lake NWR Water Rights

Priority	Ditch	Priority Date Use	Refuge CFS	Acres	Source
Permit #5617	Soda Lake Reservoir	1947 Storage Irrigation	153AF	--	Pioneer Ditch Natural Springs Runoff
Permit #20459	Soda Ditch	1947 Supplemental	--	188	Pioneer Ditch Natural Springs Runoff
Permit #5631	Harman Reservoir	1947 Storage	87AF	--	Pioneer Ditch Natural Springs Runoff
Permit #20133	Harman Ditch	1947 Irrigation	--	--	Pioneer Ditch Natural Springs Runoff
#20132		1947 Irrigation	1.10	--	
Permit #4454	Johnson #1 Stock Res.	1962 Storage	1.37AF	--	Pioneer Ditch Runoff
Permit #4455	Johnson #2 Stock Rex.	1962 Storage	1.72AF	--	Pioneer Ditch Runoff
Permit #7259	Mortenson Lake	1967 Storage	247AF	--	Pioneer Ditch Natural Springs Runoff

II. 1993 Water Usage

The only water the refuge received this year was supplemental runoff water in the South Canal from adjacent landowner Swanson. The South Canal was turned on in mid May and flowed until early September with the refuge receiving 240 acre feet of water. This water was used to irrigate and eventually flowed into Gibbs pond.

A ditch check was installed in the outlet ditch of Mortenson Lake and a water control/flush out structure in Little Mortenson Lake. Through the use of these structures the water in Little Mortenson Lake can be regulated and/or flushed to help control the alkalinity level in the lake.

III. Capacity of Refuge Lakes

Lakes	Maximum Surface Acres	Maximum Acre Feet	Actual Surface Acres (Est.) 4/93	12/93
Mortenson	65	247	63	65
Little Mortenson	--	--	--	--
Soda	46	152	40	46
Gibbs	--	--	--	--
Harman	--	--	--	--
TOTALS	111	399	103	111

IV. 1994 Proposed Water Use

Any excess water in the South canal will be diverted for irrigation purposes as in pervious years.